

REMARKS

The office action of 04-23-2004 has been reviewed and its contents carefully noted. Reconsideration of this case, as amended, is requested. Claims 1-9 remain in this case.

Rejection(s) under 35 U.S.C. §103

Claims 1-9 were rejected under 35 U.S.C. 103(a) as being unpatentable over *Eguchi* (US 6,311,658) in view of *Jung* (US 5,941,202).

As stated by the Examiner, Eguchi does NOT teach or disclose the electromagnetic locking device.

However, Jung does NOT teach or suggest an electro-magnetic locking mechanism, wherein within a predetermined range of rotation along **any** segment of the whole 360° circumference of the phaser **any** point therein is disposed to be the locking position, thereby when the locking device is disengaged the fixed angular relationship is maintained. Therefore, combining Eguchi and Jung would NOT teach or suggest the claimed invention.

Jung teaches a device for varying valve timing and engaging a cam shaft, in particular for a V-type engine. The device includes a cam shaft on which cams are mounted, a cam shaft pulley for transmitting power from a crank shaft to the cam shaft, a plate for placing the cam shaft pulley in engagement with the cam shaft, and an electromagnet mounted on the cam shaft pulley, the electromagnet being selectively engaged with the plate when electric power is applied thereto. **First and second locking pins** are provided in the cam shaft for engaging the plate. The locking pins are arranged **in relatively eccentric positions** and have **different radial positions**. The engagement between the plate and the cam shaft is achieved selectively by engaging **one of the locking pins** with the plate. Structure is provided for controlling movement of the locking pins to engage the locking pins with the plate selectively and for applying electric power to the electromagnet according to driving conditions of a vehicle.

The operation of Jung is described in column 4, lines 20-43, which is listed below for the benefit of the Examiner:

The above described embodiment operates as described below.

During high speed or high load, the ECU 12 forms the magnetic field in the magnetic coil assembly 10 by applying electric energy to the magnetic coil assembly 10 so that the plate 40 is coupled magnetically to the pulley 4. Then, the ECU 12 opens the first valve 36 and closes the second valve 38 to increase hydraulic pressure in the first cylinder 20. **The first locking pin 24 is pushed into the first hole 46** and, as a result, rotational motion is transferred to the cam shaft 2 through the pulley 4, the plate 40, and the first locking pin 24 to **rotate the cam shaft 2**.

In this position, if the vehicle speed is increased and there is a need to vary valve timing, the ECU 12 operates the first and second solenoid valves 36 and 38 to close the first solenoid valve 36 and to open the second solenoid valve 38. Then, the first locking **pin 24 is released** from the first locking hole 46 by the biasing of the elastic member-28 **and the second locking pin 26** is pushed in the second locking hole 48. As a result, the cam shaft 2 is **engaged with the plate 40** through the second locking pin 26. Since the second cylinder 22 is eccentrically positioned by **β degrees with respect to the first cylinder 20**, the engagement between the plate 40 and the cam shaft 2 through the second locking hole 48 and the second locking pin 26 results in the cam phase being changed by **β degrees** to change valve timing. (emphasis added)

As can be seen, Jung teaches two discrete positions spanned by a predetermined value (β degrees) to change valve timing. The two positions have to be discrete and only limited to two positions since there are only two lock bin taught or described. Although more than two lock pins may be used (Applicant is NOT admitting that Jung teaches more than two pins.), it is obvious that due to the physical limitations of Jung mechanism only a limited number of pins may be accommodated therein. Whereas, on the other hand, the instant invention claims an electro-magnetic locking mechanism, wherein within a predetermined range of rotation along any segment of the whole 360° circumference of the phaser any point therein is disposed to be the locking position, thereby when the locking device is disengaged the fixed angular relationship is maintained.

The amended claim 1, recites as follows:

A locking device for maintaining a fixed angular relationship between a driving shaft and a driven shaft, the locking device being adapted to be used in an internal combustion engine, the locking device comprising:

a variable camshaft timing phaser having a center mounted spool valve, wherein a null position is hydraulically controlled, the phaser having a plurality of angular relationships;

an electro-magnetic locking mechanism, wherein within a predetermined range of rotation along **any** segment of the whole 360° circumference of the phaser **any** point therein is disposed to be the locking position, thereby when the locking device is disengaged the fixed angular relationship is maintained;
and

a locking plate interposed between the phaser and the locking mechanism.
(emphasis added)

Combining Jung and Eguchi would NOT teach or suggest claim 1, at least NOT teach or suggest emphasized features.

With regard to dependent claims 2-9, by virtue of their dependency are deemed patentable as well. Furthermore, in claim 3, in which a strap drive, which is NOT seen to be taught or suggested in either Jung or Eguchi, as well as in combination of the two, is claimed. In other words, all claim limitations must be considered, especially when missing from prior art. In comparing Eguchi and/or Jung to the claimed invention, the claim limitations of the presently claimed invention may not be ignored in an obviousness determination.

The present invention in claim 3 recites:

3. The locking device of claim 1 further comprising **a strap drive** *interposed between the phaser and the locking plate* for biasing the locking device toward the electro-magnetic locking mechanism. (emphasis added)

Such a feature is not taught or suggested by either Jung, or Eguchi, nor in combination of the two]. At least the emphasized features are NOT taught or suggested by them. Therefore, claim 3 is not obvious in view of the two cited references.

Reconsideration and withdrawal of the rejection are respectfully requested.

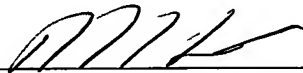
Conclusion

Applicant believes the claims, as amended, are patentable over the prior art, and that this case is now in condition for allowance of all claims therein. Such action is thus respectfully requested. If the Examiner disagrees, or believes for any other reason that direct contact with

Applicants' attorney would advance the prosecution of the case to finality, he is invited to telephone the undersigned at the number given below.

"Recognizing that Internet communications are not secured, I hereby authorize the PTO to communicate with me concerning any subject matter of this application by electronic mail. I understand that a copy of these communications will be made of record in the application file."

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